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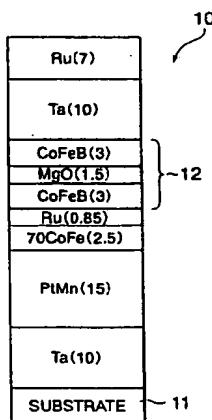
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(54) Magnetoresistance effect device and method of production of the same

(57) A magnetoresistance effect device including a multilayer structure having a pair of ferromagnetic layers and a barrier layer positioned between them, wherein at least one ferromagnetic layer has at least the part contacting the barrier layer made amorphous and the barrier layer is an MgO layer having a single crystal structure.

FIG. 1





DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (IPC)						
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim							
A	EP 1 061 592 A (MATSUSHITA ELECTRIC IND CO LTD [JP]) 20 December 2000 (2000-12-20) * paragraphs [0202], [0208], [0209]; claims 23,46 *	1-6	INV. H01L43/08 H01L43/12 H01F41/30						
A	PLATT C L ET AL: "Spin polarized tunneling in reactively sputtered tunnel junctions" JOURNAL OF APPLIED PHYSICS, AMERICAN INSTITUTE OF PHYSICS, NEW YORK, US, vol. 81, no. 8, 15 April 1997 (1997-04-15), page 5523, XP012042507 ISSN: 0021-8979 * page 5523, left-hand column, line 32 - right-hand column, line 3 *	1-6							
A,D	YUASA S ET AL: "High tunnel magnetoresistance at room temperature in fully epitaxial Fe/MgO/Fe tunnel junctions due to coherent spin-polarized tunneling" JAPANESE JOURNAL OF APPLIED PHYSICS, PART 2 (LETTERS) JAPAN SOC. APPL. PHYS JAPAN, vol. 43, no. 4B, 15 April 2004 (2004-04-15), pages L588-L590, XP002441990 ISSN: 0021-4922 * the whole document *	1-6							
		-/-	TECHNICAL FIELDS SEARCHED (IPC)						
			H01L H01F G11C						
<p>1 The present search report has been drawn up for all claims</p> <table border="1"> <tr> <td>Place of search</td> <td>Date of completion of the search</td> <td>Examiner</td> </tr> <tr> <td>Munich</td> <td>11 July 2007</td> <td>Gröger, Andreas</td> </tr> </table> <p>CATEGORY OF CITED DOCUMENTS</p> <p>X: particularly relevant if taken alone  Y: particularly relevant if combined with another document of the same category  A: technological background  O: non-written disclosure  P: intermediate document</p> <p>T: theory or principle underlying the invention  E: earlier patent document, but published on, or after the filing date  D: document cited in the application  L: document cited for other reasons  &amp;: member of the same patent family, corresponding document</p>				Place of search	Date of completion of the search	Examiner	Munich	11 July 2007	Gröger, Andreas
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Munich	11 July 2007	Gröger, Andreas							



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X, P	<p>MATSUMOTO ET AL: "Tunneling spectra of sputter-deposited CoFeB/MgO/CoFeB magnetic tunnel junctions showing giant tunneling magnetoresistance effect"            SOLID STATE COMMUNICATIONS, OXFORD, GB, vol. 136, no. 11-12, December 2005 (2005-12), pages 611-615, XP005188210            ISSN: 0038-1098            * the whole document *</p> <p>-----</p>	1-6	
A, P	<p>PARKIN S S P ET AL: "Giant tunnelling magnetoresistance at room temperature with MgO (100) tunnel barriers"            NATURE MATERIALS NATURE PUBLISHING GROUP UK, vol. 3, no. 12, December 2004 (2004-12), pages 862-867, XP002441991            ISSN: 1476-1122            * the whole document *</p> <p>-----</p>	1-6	
TECHNICAL FIELDS SEARCHED (IPC)			
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search		Examiner
Munich	11 July 2007		Gröger, Andreas
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X : particularly relevant if taken alone	T : theory or principle underlying the invention		
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ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.

EP 05 07 7020

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on. The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

11-07-2007

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1061592	A 20-12-2000	KR 20010007428 A KR 20030011025 A US 6436526 B1	26-01-2001 06-02-2003 20-08-2002
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EPO FCRM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82